

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-10 and 15-25 are presently active in this case. The present Amendment amends Claims 2-3, 6-8 and 10; cancels Claims 11-14 and adds Claims 15-25.

The outstanding Office Action made the Restriction Requirement final and rejected Claims 3 and 10 under 35 U.S.C. § 112, second paragraph, as indefinite. Claims 1-5 were rejected under 35 U.S.C. § 103(a) as unpatentable over ASPA (Admitted State of the Prior Art) in view of Miyakawa et al. (U.S. Patent No. 6,473,995, herein referred as “Miyakawa”). Claims 9 and 10 were rejected under 35 U.S.C. § 103(a) as unpatentable over Takamori et al. (U.S. Patent No. 6,261,007, herein referred as “Takamori”) in view of the ASPA.

Claims 6-8 were indicated as allowable if rewritten in independent form. Applicant acknowledges with appreciation the indication of allowable subject matter.

In response, Claims 6-8 are rewritten in independent form. Additionally, new Claims 15-20 are added to vary the scope of protection recited in the claims. New Claim 15 is dependent on allowable and now independent Claim 6, including features of amended Claim 2. New Claim 16 is dependent upon new Claim 15, including features of amended Claim 3. New Claim 17 is dependent upon new Claim 15, including features of Claim 4. New Claim 18 is dependent upon new Claim 15, including features of Claim 5. New Claim 19 is dependent upon allowable and independent Claim 6, and includes features of Claim 9. New Claim 20 is dependent on new Claim 19, and includes features of amended Claim 10. Accordingly, new Claims 15-20 do not raise a question of new matter and are allowable at least for the same reasons Claim 6 is allowable.

In order to clarify Applicants’ invention, Claim 2 is amended to recite “wherein a second exhaust flow rate is larger than a first exhaust flow rate.” This change finds non-

limiting support in the specification as originally filed, for example at page 13, line 18 to page 14, line 11. Therefore, this change is not believed to raise any questions of new matter.

New Claims 21-25 are also added to further vary the scope of protection recited in the claims. New Claim 21 depends upon Claim 1 and recites that “the flow rate set value is varied at least in two steps after a time when the solvent in the coating liquid starts to actively evaporate,” which finds non-limiting support in the specification as originally filed, for example at page 11, lines 14-19. New Claim 22 depends upon Claim 1 and recites that “a second exhaust flow rate is larger than a first exhaust flow rate during a period while the solvent is actively evaporating from said coating liquid,” which finds non-limiting support in the specification as originally filed, for example at page 11, lines 20-29. New Claim 23 depends upon Claim 1 and recites that “the flow rate set value is varied at least in three steps after a time when the solvent in the coating liquid starts to actively evaporate,” which finds non-limiting support in the specification as originally filed, for example in Figs. 6C-D. New Claim 24 depends upon Claim 1 and recites that “a second exhaust flow rate is smaller than a first exhaust flow rate and a third exhaust flow rate is larger than the second exhaust flow rate, during a period while the solvent is actively evaporating from said coating liquid,” which finds non-limiting support in the specification as originally filed, for example in Figs. 6C-D. New Claim 25 depends upon Claim 1 and recites that “the solvent actively evaporates from the surface of the substrate and the straightening vane is configured such that a vapor flows outward through a small gap between the surface of the substrate and the straightening vane,” which finds non-limiting support in the specification as originally filed, for example at page 13, lines 22-24.

In response to the Restriction Requirement being made final, Claims 11-14, directed to non-elected inventions, are canceled. Applicants reserve the right to present claims

directed to the non-elected inventions in a divisional application, which shall be subject to the third sentence of 35 U.S.C. § 121.¹

In response to the rejection under 35 U.S.C. § 112, second paragraph, Claims 3 and 10 are amended to correct the noted informalities. Claim 3 is amended to recite “a timing for switching between the first flow rate set value and the second flow rate set value includes setting in advance a timing at which high in-plane uniformity in terms of film thickness is attained, based on experiments performed in advance for each type of a solvent contained in a resist liquid, and a concentration of a resist component, and each film thickness of a coating liquid, and carrying out switching at this timing.” Claim 10 is amended to recite “further comprising a control portion controlling a flow rate set value for said exhaust flow rate regulating portion such that while the solvent is actively evaporating from said coating liquid, the pressure in said airtight container is set so as to be slightly higher than a pressure at which the solvent at room temperature attains to a boiling point in said airtight container in which pressure has been reduced.” The changes to Claims 3 and 10 are only formal in nature, and are not believed to raise a question of new matter.² In view of amended Claims 3 and 10, it is believed that all pending claims are definite and no further rejection on this basis is anticipated. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work with the Examiner in a joint effort to derive mutually acceptable language.

In response to the rejection of Claims 1-5 under 35 U.S.C. §103(a), Applicants respectfully request reconsideration of this rejection and traverse the rejection, as discussed next.

¹ "A patent issuing on an application with respect to which a requirement for restriction under this section has been made ... shall not be used as a reference ... against a divisional application." See also MPEP 804.01.

² See MPEP 2163.06 stating that "information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

Briefly recapitulating, Applicants' invention, as recited in Claim 1, relates to an apparatus for drying a solvent in a coating liquid placed on a substrate, when the substrate with the coating liquid is under reduced pressure. As explained in Applicants' specification at page 3, lines 20-25 with corresponding Fig. 4, Applicants' invention improves upon conventional drying apparatuses because it achieves relatively easy adjustment of a drying time period as well as improved in-plane uniformity of the film thickness. The claimed invention thus leads to improved drying of coating liquids under reduced pressure.³

The outstanding Office Action acknowledges that the ASPA (Admitted State of the Prior Art) fails to teach or suggest a flow rate controller for controlling the exhaust flow rate and varying the flow rate in at least two steps so as to remove solvent from the coating liquid.⁴ The outstanding Office Action rejects Applicants' Claims 1-5 based on the proposition that Miyakawa discloses the above feature,⁵ and that it would have been obvious to modify the ASPA by importing this feature from Miyakawa to arrive at Applicants' claimed invention. Applicants respectfully submit, however, that Miyakawa fails to disclose the claimed control portion that varies the flow rate set value at least in two steps while the solvent is actively evaporating from the coating liquid, as next discussed.

The applied prior art Miyakawa discloses a vacuum drying apparatus where it is possible to reduce the drying time.⁶ Miyakawa, however, fails to teach or suggest Applicants' claimed control portion that varies the flow rate set value at least in two steps while the solvent is actively evaporating from the coating liquid.

Miyakawa teaches that the solvent of the coating liquid gradually *evaporates at approximately constant vacuum degree*.⁷ Miyakawa further discloses that the vacuum chamber is *exhausted at a slow rate* to evaporate the solvent of the coating liquid gradually

³ See Applicants' specification at page 4, lines 11-21.

⁴ See outstanding Office Action at page 3, lines 23-25.

⁵ See outstanding Office Action from page 3, line 3 to page 4, line 2.

⁶ See Miyakawa in the Abstract.

⁷ See Miyakawa at column 6, lines 5-7.

up to the terminal pressure v2,⁸ and that the time required for the solvent evaporating step is t2.⁹ Additionally, in Fig. 5 Miyakawa shows that during the evaporation phase t2, the set value of the flow rate is not changed, resulting in a constant increase of the vacuum degree to V2 during a time t2. An apparatus that evaporates the solvent of the coating liquid gradually *at approximately constant vacuum degree*, as taught by Miyakawa, is *not* a control portion that varies *the flow rate set value at least in two steps* while the solvent is actively evaporating from the coating liquid container, as would be required to meet Applicants' Claim 1. Therefore, even if the combination of the ASPA (Admitted State of Prior Art) and Miyakawa is assumed to be proper, the combination fails to teach every element of the claimed invention. Accordingly, Applicants' respectfully traverse, and request reconsideration of, this rejection based on these patents.¹⁰

Although the Miyakawa reference discloses an apparatus reducing the solvent evaporation time by means of pressure reduction mechanism,¹¹ Applicants' disclosure is concerned with the "evenness of a film thickness in the peripheral portion of the coating film" and this is achieved by "controlling the flow of the evaporating solvent."¹²

Furthermore Applicants respectfully submit that the Miyakawa patent neither discloses nor suggests the "straightening vane" as recited in Claim 1. According to the present invention, a straightening vane is provided so that the exhaust stream smoothly flows from a center of a plane towards a periphery over the substrate surface. The exhaust that has flown between the substrate surface and the surface of the straightening vane flows through a space between the straightening vane and the top portion of the airtight container shown in

⁸ See Miyakawa at column 6, lines 23-26.

⁹ See Miyakawa at column 6, lines 28-29.

¹⁰ See MPEP 2142 stating, as one of the three "basic criteria [that] must be met" in order to establish a *prima facie* case of obviousness, that "the prior art reference (or references when combined) must teach or suggest all the claim limitations," (emphasis added). See also MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

¹¹ See Miyakawa at column 1, lines 47-59.

¹² See Applicants' disclosure, for example at page 4, lines 25-31.

Fig. 4 of the disclosure. This feature has been made explicit in new dependent Claim 25. Thereafter the exhaust is rapidly discharged from the top portion. Miyakawa does not disclose or suggest such a structure.

Furthermore, according to Applicants' Claim 2, a flow rate set value is switched from a first flow rate set value attaining a smaller flow rate to a second flow rate set value with a larger flow rate than the first flow rate set value. In contrast, the ASPA provides no suggestion of switching the flow rate set values. Additionally, Miyakawa switches the flow rate from a first flow rate set value attaining a larger flow rate to a second flow rate set value attaining a smaller flow rate. In Miyakawa, a gas in the vacuum chamber is exhausted at a high rate to a vacuum degree slightly lower than the vacuum degree at which the coating liquid evaporates actively. If the vacuum degree is now increased, the evaporation rate of the solvent of the coating liquid is abruptly elevated. Therefore the gas in the vacuum chamber is now exhausted at a constant low rate to cause the solvent of the coating liquid to evaporate gradually. This is in contrast with Applicants' disclosure, wherein when the solvent starts to evaporate actively, the flow rate is set to Q1, and thereafter the flow rate is increased to Q2.¹³

Claims 9 and 10 depend from Claim 1. Therefore, in response to the rejection of Claims 9 and 10, Applicants respectfully traverse, and request reconsideration of this rejection at least for the same reasons discussed above with respect to the rejection of Claims 1-5. The Takamori reference does not remedy the deficiencies of the Miyakawa and ASPA. In particular, the Takamori reference fails to teach or suggest the control portion that varies the flow rate set value at least in two steps while the solvent is actively evaporating from the coating liquid.

¹³ See Applicants' disclosure, for example in Figs. 6A and 6B.

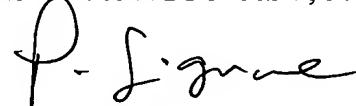
Furthermore, new dependent Claims 21-25 teach additional features that, when considered in combination with the features of Claim 1, are believed to be patentably distinct over the applied prior art.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-10 and 15-25 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representative at the below listed telephone number.

Respectfully submitted,

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